TO:	Mr. Carl P. Garvey and Mr. M. Brendan Mullen (Revitalizing Auto Communities Environmental Response Trust) Mr. Alan J. Knauf and Ms. Linda R. Shaw (Knauf Shaw LLP)
FROM:	Katherine Lasseter, Jason Dittman, Jamie Combes, and Alice England (TIG Environmental) 443 North Franklin Street, Suite 220, Syracuse, NY 13204
SUBJECT:	**Evidence Summary Memorandum for the Bristol-Myers Squibb/Fulton Iron & Steel Site**
DATE:	October 2, 2019

1. Introduction

Revitalizing Auto Communities Environmental Response (RACER) Trust and Knauf Shaw LLP (Knauf Shaw) contacted TIG Environmental[1] to provide consulting services regarding potentially responsible party (PRP) identification and investigation, sampling and data analysis, and expert witness testimony to support RACER Trust and Knauf Shaw during litigation proceedings stemming from a Civil Action No.: 5:18-cv-1267 [DNH/ATB] filed on October 26, 2018 (the Complaint) (RACER 2018).

In the Complaint, RACER Trust, by its attorneys, Knauf Shaw LLP, brings claims for cost recovery and contribution under Sections 107(a) and 113(f) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) 42 U.S.C. 9607(a) and 9613(f), inter alia, against parties (Defendants) operating in or around the Ley Creek Watershed Site (Study Area) in Onondaga County, New York. The Complaint asserts that the Defendants are responsible to contribute to the cost of past and future investigations to address contamination in and around the Study Area.

The Study Area consists of the GM-Inland Fisher Guide Facility (GM-IFG) Sub-Site Operable Unit 1 (OU-1), the expanded OU-2 area (Ley Creek from Townline Road west to Route 11, including creek banks and limited floodplain and hotspot areas), and tributaries upstream of Townline Road bridge. As defined in the Record of Decision (ROD) for OU-2, the identified contaminants of concern (COCs) at the Site are polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), chromium, copper, lead, nickel, and zinc. PCBs are the predominant contaminants in Ley Creek sediments (NYSDEC and EPA 2015).

[1] TIG Environmental is a member of The Intelligence Group, LLC.

Evidence Summary Memorandum for the Bristol-Myers Squibb/Fulton Iron & Steel Site

In this evidence summary memorandum (ESM), TIG Environmental reviewed evidence gathered by RACER Trust and Knauf Shaw to evaluate the following for each Defendant's site:

- Documented and suspected PCB usage at the Defendant's site
- The existence of PCB-containing electrical equipment or electrical substations (utility- or Defendant-owned) on Defendant's site
- Whether pathways exist between the Defendant's site and the Ley Creek watershed (defined as Ley Creek and its tributaries)

Sections 2 through 4 summarize the available information on Defendant operations related, or potentially related, to PCB usage; detections of contaminants at or related to the Defendant's site; permits, waste handling, spills, and/or releases at each site; whether pathways from the Site to Ley Creek watershed can be determined; data gaps; and proposed sampling to address identified data gaps. Defendant information, site ownership information, and dates of operation for the Defendant's site are available in Knauf Shaw's site dossier (Knauf Shaw Bristol Myers Site Dossier 2019).

2. Description of Site Operations Related to PCBs

This report focuses on the Bristol-Myers Squibb (BMS) Site and the adjacent Fulton Iron & Steel (Fulton) Site, which is currently owned by BMS. The parcel is composed of several addresses on Thompson Road and Burnet Avenue in East Syracuse/ Dewitt, with the Fulton Site occupying the southeast corner of the Site in the area east of South Branch Ley Creek, and the BMS Site consisting of the remainder of the parcel. While BMS currently owns the entire parcel, for purposes of this memorandum they will be addressed individually because the Fulton Site has not been used by BMS, and Fulton operations were conducted by a separate entity.

Within the BMS Site, two portions were designated for remediation studies: the brownfield development area (BDA),[2] a 23-acre contaminated portion in the central western area of the property (Knauf Shaw Bristol Myers Site Dossier, 2, 4), and the Bristol Labs landfill, a 1.5-acre inactive landfill listed as the Class 3 registry site[3] located to the north of the Fulton Site (Knauf Shaw Bristol Myers Site Dossier, 3; NYSDEC 2019a).

The dossier map also indicates a second discontinuous parcel owned by BMS, located at approximately 6194 Thompson Road (north of the railroad tracks); however, as this address is not listed in the dossier and no further information was provided, it will not be addressed in this memorandum.

[2] The BDA is also referred to as the "BMS Syracuse North Campus Restoration Area," listed under Brownfield Cleanup Program Site #C734138 (NYSDEC 2019c).

[3] NYSDEC listed the Bristol Labs landfill as a Class 3 registry site under New York State Superfund Site #734001 (NYSDEC 2019a). Classification code 3 refers to a site that does not pose a significant threat to human health and the environment, either presently or in the foreseeable future (NYSDEC 2019d).

Evidence Summary Memorandum for the Bristol-Myers Squibb/Fulton Iron & Steel Site

2.1.1 BMS Site History and Operations Related to PCBs

BMS Site History

BMS purchased the BMS Site in 1943 from Cheplin Laboratories, an existing penicillin production plant,[4] and continued to manufacture penicillin (FOIL034697 at FOIL034710). Nearly 70 percent of the world's penicillin supply was produced at the BMS Site until the mid-2000s (Verdict Media Limited 2019). BMS expanded operations on the BMS Site, eventually including 100 buildings (most constructed prior to the 1990s), with functions ranging from laboratories, fermentation and extraction, solvent and chemical storage, electrical supply and utilities, office and administration, drum storage, and treatment plants (FOIL034697 at FOIL034764–FOIL034766). By 2007, all bulk production of antibiotics at the BMS Site had been phased out due to global competition (FOIL034697 at FOIL034714). As part of the BMS Syracuse Facilities Transformation Project (Transformation Project), from 2011 to 2013, the majority of the buildings were decommissioned and demolished to transition onsite operations toward a penicillin-free biopharmaceutical research center; these operations continue to the present (FOIL034697 at FOIL034708).

BMS Site Operations Related to PCBs

Monsanto sales records indicate that BMS purchased 4,800 pounds (lbs) and 1,200 lbs of Therminol[5] FR-1 in 1970 and 1971, respectively, for delivery to the Site in Syracuse (Monsanto 1975, 5; Versar 1982, 35). Therminol FR-1 is a heat transfer fluid containing Aroclor 1242 (Erickson and Kaley 2011, 10). Therminol FR-1 was commonly used in heat transfer systems (Erickson and Kaley 2011, 11). No early description of heat exchange systems was found in the reviewed documents; however, during demolition of Building 25N in 2018, a heat exchanger that contained Syltherm XLT heat exchange fluid[6] was removed (FOIL033818 at FOIL033818). Building 25N was equipped with heat exchange fluid storage tanks and soil around the vaults/tanks appeared stained (FOIL033852 at FOIL033852). It does not appear that the stained soil was tested for PCBs (FOIL009128 at FOIL009302). Available information does not describe the nature of the heat exchange system that existed before 2018; however, based on the descriptions of purchases of a fluid typically used for heat exchange purposes, the confirmed existence of a heat exchange system, and the disposal of PCB-containing waste from material other than transformers, it is reasonable to conclude that the BMS facility was equipped with a PCB-containing heat exchange system at one time (Knauf Shaw Site Bristol Myers Site Dossier, 2; FOIL033818 at FOIL033818; Knauf Shaw Bristol Myers Exhibit B, 1–3).

In addition to the heat exchange system, the BMS facility was also equipped with an unknown quantity of PCB-containing transformers. In 1987, BMS performed transformer service resulting in 4,835 gallons of PCB oil waste, classified as B002 waste[7](Knauf Shaw Bristol Myers Exhibit B, 1). Two PCB transformers (B006 waste) were removed in 2003, resulting in 4,179 kilograms (kg) (9,213 pounds [lbs]) of PCB-

[4] Cheplin Laboratories operated as a penicillin plant starting in 1923 before it was sold to Bristol Myers in 1943. In 1945, Bristol Myers officially changed the facility name to Bristol Laboratories, Inc. (FOIL077505).

[5] Historically, Therminol was a registered trade name for Monsanto's PCB-containing heat transfer fluids. The Therminol trade name currently in use no longer contains PCBs (Erickson and Kaley 2011, 5).

[6] Syltherm XLT is a silicone heat exchange fluid (non-PCB) currently sold by Dow (Dow 2019).

[7] Waste is classified according to New York Codes, Rules and Regulations (CRR-NY), specifically 6 CRR-NY 371.4 (e). Wastes classified as B001–B007 contain polychlorinated biphenyls (PCBs) (6 CRR-NY 371.4, 20–21).

containing waste (Knauf Shaw Bristol Myers Exhibit B, 2). According to a work plan prepared by BMS's consultants in 2013, transformers onsite did not contain PCB oil and have been "non-PCB" since at least 1990 (FOIL034697 at FOIL034729), although information on oil-filled transformers in earlier BMS documents defines "non-PCB" as containing <50 parts per million (ppm) PCBs (FOIL013793 at FOIL013805).

Surface soil in four outdoor transformer areas (located near buildings 8D, 9, 22A, and 52) was tested specifically for PCBs in 2013 as part of remedial investigations for the Brownfield Cleanup Agreement[8] (BCA) on the BMS Site (FOIL096401 at FOIL096416, FOIL096917). Only one sample near the transformer adjacent to building 8D contained PCBs[9] above the New York state unrestricted soil cleanup objective (SCO) criterion[10] (0.1 milligram per kilogram [mg/kg]) with an estimated concentration of 0.75 mg/kg (0.75 ppm) (FOIL096401 at FOIL096416, FOIL096490). No further action was required because PCBs were not detected above the New York state commercial SCO (1 mg/kg) (FOIL096401 at FOIL096458). Only outdoor transformers within the BDA were included in this study; however, the BMS Site contains other transformers outside of the BDA boundary (FOIL013793 at FOIL0137803, FOIL013805). BMS drained and removed several indoor or rooftop transformers as part of the Transformation Project. BMS also outlined plans to test for PCBs if any stained soils were found after transformer building demolitions (FOIL034697 at FOIL034729). During demolition of building 52, transformer oil from a "non-PCB" transformer leaked onto the surrounding concrete and gravel. The oil was verified to contain <50 ppm PCBs, was disposed of as nonhazardous waste, and the containment area was decontaminated (FOIL007505 at FOIL007515, FOIL007536).

In addition to the four outdoor transformer areas, surface soil samples at two depths (0–2 inches [in] and 2–12 in) were collected in 25 locations throughout the BDA and analyzed for PCBs in 2014 (FOIL096401 at FOIL096417–FOIL096418, FOIL096455). Of the 50 samples collected, seven samples in five locations were found to contain PCBs (Aroclors 1248, 1254, 1260, and total PCBs) (FOIL096401 at FOIL096436, FOIL096502, FOIL096505, FOIL096508). Five samples in four locations exceeded the unrestricted SCO criterion for total PCB concentration (0.1 mg/kg [0.1 ppm]), as shown in the table below (FOIL096401 at FOIL096455, FOIL096502, FOIL096505, FOIL096927).

[8] In 2011, the Brownfield Cleanup Agreement between BMS and New York State Department of Environmental Conservation (NYSDEC) required several phases of remedial investigations on the BDA within the BMS Site (FOIL096401 at FOIL096411).

[9] Beginning in 1935, Swann Chemical Company, followed by the Monsanto Company produced commercially available PCB-containing goods in a line of products known as "Aroclors." Each of the 10 common PCB Aroclor mixtures are generally associated with certain signatures of PCB congeners (there are 209 PCB congeners) (Erickson and Kaley 2011, 2–3). The style of reporting analytical data for PCBs varies in reviewed documentation. Results may be reported as individual Aroclors and/or congeners, as a sum of all or some of these analytes, or simply as "PCBs." For purposes of this memorandum, TIG Environmental will state "total PCBs" when the source document has reported analytical results as either "PCBs" or "total PCBs." This is presumed to represent the sum of PCB Aroclors or congeners. TIG Environmental will report Aroclor- or congener-specific data where that information is available.

[10] New York state unrestricted and commercial soil cleanup objectives (SCOs) are defined according to the New York Codes, Rules and Regulations (CRR-NY), specifically 6 CRR-NY 375-6.8 (a) and (b) (6 CRR-NY 375-6.8, 2,4).

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Sample ID	Depth	Concentration	
	In inches	In mg/kg	In ppm
BCP-SS-03	0–2	0.25	0.25
BCP-SS-03	2–12	0.38	0.38
BCP-SS-08	2–12	Estimated 0.21	0.21
BCP-SS-20	2–12	0.31	0.31
BCP-SS-13	2–12	Estimated 0.25	0.25

One location, BCP-SS-22, exceeded the commercial SCO criterion for total PCBs (1 mg/kg [1 ppm]) at depths of 0–2 in and 2–12 in, with estimated concentrations of 1.8 mg/kg (1.8 ppm) and 1.4 mg/kg (1.4 ppm), respectively (FOIL096401 at FOIL096455, FOIL096508, FOIL096926). BCP-SS-22 was located between an administrative building (building 22) and Thompson Road, and the source of contamination was suggested to be related to the utilities entering the building from the Thompson Road side (FOIL009128 at FOIL009132). The elevated PCB level in this area necessitated additional sampling (FOIL096401 at FOIL096416, FOIL096459). BMS developed a new work plan to further investigate PCB content in the original sample location and in 13 nearby soil boring samples (FOIL040264 at FOIL040269). PCB analytical results showed 11 boring locations with total PCB concentrations above the commercial SCO and four boring locations with concentrations above the unrestricted SCO with the highest concentration reported at 11 mg/kg (11 ppm). (FOIL031913 at FOIL031915–FOIL031922). A subsequent letter from NYSDEC from February 2018 suggested that the remaining higher PCB concentrations in this area were likely from a transformer spill that would have occurred along the power lines to the west, and that further subsurface delineation of PCBs must be conducted (FOIL013182 at FOIL013182–FOIL013183). No information is available to determine if the delineation has occurred. There are also several underground electric lines identified in the sample area near the areas with highest PCB concentrations (FOIL031913 at FOIL031923).

During the Transformation Project demolition and site reconfiguration efforts between 2011 and 2013, investigators identified and removed PCB-containing caulk and hydraulic oils (FOIL007505 at FOIL007513, FOIL007535). The PCB-containing caulk was removed from windows in buildings 22 and 22A. The sampling locations were not specified for the hydraulic oils (FOIL009128 at FOIL009492, FOIL033818 at FOIL033818). No analytical records to identify the total PCB or Aroclor content in the caulk and hydraulic oils are available in the reviewed documents. These materials are known to have contained PCBs prior to 1977,[11] particularly Aroclor 1254 in caulks and Aroclors 1232–1260 (Aroclors 1232, 1242, 1248, 1254, 1260) in hydraulic fluids (Erickson and Kaley 2011, 10, 11, 13, 14). In 1976, the EPA classified use of PCBs in hydraulic fluids as a “nominally closed” application[12] (EPA 1976, 227). Even though hydraulic systems are

[11] In the United States, PCBs were manufactured and used in products from 1929 through 1977, however many PCB-containing products remained in used for years after production of PCBs had ceased (Erickson and Kaley 2011, 1).

[12] On May 31, 1979, the manufacture of PCBs was banned from non-enclosed uses, effective July 2, 1979 (EPA 1979a). Although PCBs were banned for use in 1979, they did not immediately disappear and are still present throughout the environment in trace quantities. As a result of the EPA-authorized five-year phase-out period and the continued use of these banned materials (EPA 1979b), some non-enclosed sources may have continued to retain old

supposedly closed, the EPA estimated that 60 percent of the PCBs used in such systems was lost to the environment on an annual basis due to spills in the system of inadequate disposal of the PCB-containing materials (EPA 1976, 307).

In 2015, a sediment investigation was conducted along Headson's Brook and South Branch Ley Creek as part of the BMS Site BCA remedial investigations and accompanying Fish and Wildlife Resource Impact Analysis (FWRIA) (FOIL096401, FOIL095863). Forty-eight sediment samples were collected from 17 locations in Headson's Brook and South Branch Ley Creek[13] at depths ranging from 0 to 46 in below sediment surface and analyzed for PCBs (FOIL096401 at FOIL096425). PCBs were detected in 32 sediment samples, with Aroclor concentrations varying by location. Aroclors 1254 and 1260 were detected upstream of Headson's Brook, Aroclor 1254 was detected in Headson's Brook, Aroclors 1248 and 1260 were detected upstream of South Branch Ley Creek, and Aroclors 1242, 1254, and 1260 were detected in South Branch Ley Creek (FOIL096401 at FOIL096457, FOIL096843, FOIL096849, FOIL096855, FOIL096861, FOIL096867, FOIL096873, FOIL096951). In South Branch Ley Creek, the samples just downstream of outfalls #7 and #9 contained mostly Aroclors 1242 and 1254, respectively. NYSDEC freshwater Class A sediment guidance values (SVG) for total PCBs (100 micrograms per kilogram [µg/kg] [0.1 ppm]) were exceeded in the sample collected near outfall #1 in Headson's Brook (estimated 110 µg/kg [0.11 ppm]), in one sample upstream of South Branch Ley Creek (110 µg/kg [0.11 ppm]), and in three samples in South Branch Ley Creek near outfall #9 (estimated 200 to 340 µg/kg [0.2 to 0.34 ppm]). Sediment from outfall #7 in South Branch Ley Creek exceeded the Class C SVG (1,000 µg/kg [1 ppm]), with an estimated total PCB concentration of 1,500 µg/kg (1.5 ppm); however, when this location was resampled (on an unidentified date), it no longer exceeded Class C SVG concentrations (FOIL096401 at FOIL096457). Concentrations below the Class A SVG were detected in 24 samples, ranging from 21 to 93 µg/kg (0.021 to 0.093 ppm). Despite these residual PCB concentrations in the sediments, no remediation was prescribed in relation to the BDA (near the outfalls) because higher PCB concentrations were detected upstream of the BMS and Fulton Sites; therefore, BMS's consultants determined that sediments in South Branch Ley Creek and Headson's Brook are affected by non-BDA sources (FOIL096401 at FOIL096457–8). However, only one sample collected upstream of the Site contained PCBs and it was not the highest concentration detected. Higher concentrations were found near outfalls #7 and #9 in South Branch Ley Creek, and comparable concentrations were found near outfall #1 in Headson's Brook and in South Branch Ley Creek just upstream of the confluence with Headson's Brook.

In 1996 and 1997, NYSDEC analyzed sediment samples for PCBs (among other COCs) from South Branch Ley Creek both upstream and downstream of the BMS and Fulton Sites as part of the remedial program for the Onondaga Lake National Priorities List Site (Knauf Shaw Bristol Myers Site Dossier, 7–9; Knauf Shaw Bristol Myers Exhibit J, 67; NYSDEC 1997). Samples were found to contain detected concentrations of one or more of Aroclors 1242, 1248, 1254, and 1260 (Figure 1). Aroclor 1254 concentrations exceeded the NYSDEC sediment screening criterion for total PCBs in four samples, with the highest concentration found

PCB-containing material and use of enclosed sources such as transformers may have continued beyond 1984 (EPA 1976, 273; Erickson and Kaley 2011, 2–3).

[13] BMS owns the portion of South Branch Ley Creek (a tributary to Ley Creek) that runs through the BMS and Fulton Sites (Knauf Shaw Bristol Myers Site Dossier, 1). Headson's Brook has intermittent flows, runs along the boundary of the BMS Site near the railroad tracks, and discharges into South Branch Ley Creek (FOIL096401 at FOIL096412).

in the sample upstream from the BMS and Fulton Sites (120 µg/kg [0.12 ppm]) and the second highest at the boundary of the Fulton Site (100 µg/kg [0.1 ppm]) (Knauf Shaw Bristol Myers Exhibit J, 67, 191). Concentrations were lower in the downstream samples (42 µg/kg to 96 µg/kg [0.42 ppm to 0.96 ppm]), and BMS's consultants suggested that the PCB source likely originated upstream of the BMS Site (Knauf Shaw Bristol Myers Exhibit J, 67). However, concentrations in samples upstream of the Site were only slightly higher, and within the same order of magnitude, as concentrations from within the Site (Figure 1). These sediment samples were collected after PCB remediation of the Fulton Site, which is discussed in further detail in section 2.1.2.

Groundwater at the Site flows east toward South Branch Ley Creek; therefore, a high potential exists for migration of contaminants to South Branch Ley Creek (a tributary of Ley Creek) via groundwater. This is supported by consistent detection of chemicals (including sulfate, ammonia, chlorinated solvents, and total phenols) exceeding state groundwater standards in the early 1990s in numerous groundwater samples on the BMS Site (Knauf Shaw Bristol Myers Site Dossier, 4–5). Since the early 1990s the BMS Site has been under the regulatory oversight of NYSDEC related to illegal discharges of volatile organic compounds (VOCs) to the sanitary sewer (discussed further in Section 2.2); however, PCBs were not identified as a COC at that time and therefore were not analyzed for during a series of site investigation and remediation studies conducted from 1991 through 1995 (FOIL034697 at 22–23; Knauf Shaw Bristol Myers Exhibit J, 136–143; Knauf Shaw Bristol Myers Exhibit K). However, groundwater samples analyzed during the 2014 BCA remedial investigations were all non-detect for PCBs (FOIL096401 at FOIL096456, FOIL096740, FOIL096823).

The migration of chlorinated solvents in groundwater has also been documented with elevated concentrations detected in soil and groundwater near former burning pits in the Bristol Labs landfill during a site assessment conducted in 1992 (Knauf Shaw Bristol Myers Site Dossier, 5). From the mid-1950s to 1971 vials containing laboratory waste, such as acetone, peroxides, mineral oils, or chlorinated solvents, were disposed of and burned in landfill trenches, which were later backfilled (NYSDEC 2019a). The landfill is located in the area east of South Branch Ley Creek to the north of the Fulton Site, however the exact location of the trenches within the landfill area is unknown (Knauf Shaw Bristol Myers Exhibit J, 44). The landfill area drains to South Branch Ley Creek (Knauf Shaw Bristol Myers Exhibit, 44). Three groundwater samples were analyzed for PCBs in 1992, but PCBs were not detected (Knauf Shaw Bristol Myers Exhibit J, 46, 114). Soil samples were collected from eleven test pits in different locations around the landfill up to 10 feet below ground (or to groundwater), and three samples of buried black, charred waste material were reported in two of the test pits and near a concrete structure (Knauf Shaw Bristol Myers Exhibit J, 45, 99). PCBs were not detected in soil samples from the test pits, however one waste material sample contained Aroclor 1248 at 480 µg/kg (0.480 ppm), which is below the recommended 1992 NYSDEC SCO level for PCBs (1 mg/kg [1 ppm]) (Knauf Shaw Bristol Myers Exhibit J, 46, 122–123). While disposal of PCB-containing materials to the landfill is unknown, PCBs could be inadvertently generated during burning of chlorinated hydrocarbons.

Railroad Spurs

Railroad spurs exist along the site boundary (Knauf Shaw Bristol Myers Site Dossier, 1). From the 1940s to the mid-1980s, transformers were used on rail cars (Slater 1996, 21). PCB fluids and electrical equipment

were used in railroad systems (USDOT 1984, 25) and the resulting PCB contamination is an issue at railcar maintenance locations and transit yards (Slater 1996, 29). Equipment typically used in railroad systems includes railroad (on-board) transformers and capacitors (Slater 1996, 31). Several PCB Aroclors can be associated with paints, and Aroclors 1260 and 1254 are specifically associated with transformers (Erickson and Kaley 2011, 10).

2.1.2 Fulton Site History and Operations Related to PCBs

Fulton Site History

BMS purchased the adjacent Fulton Site around 1997. The Fulton Site had operated as a metal scrapyard from 1959 until 1993 (Knauf Shaw Bristol Myers Site Dossier, 1). The Fulton Site consisted of an office building, a warehouse, a garage, three press houses, a shear building, two underground storage tanks (USTs) containing gasoline, and a power station (Knauf Shaw Bristol Myers Exhibit H, 15; NYSDEC 2019b). BMS voluntarily participated in PCB remediation activities[14] for the Fulton Site in 1996 (Knauf Shaw Bristol Myers Site Dossier, 1–3). Post removal of PCB-contaminated soil, all excess debris was removed, buildings were demolished, and the Fulton Site was covered with topsoil and hydroseed (Knauf Shaw Bristol Myers Exhibit H, 35–36). Based on satellite images it does not appear the BMS has conducted any operations on the Fulton Site (Google Earth 2019).

Fulton Site Operations Related to PCBs

Known activities at the Fulton Site included draining acquired materials (e.g. cars and appliances) of fluids, such as motor oil, gasoline, and hydraulic oils, and then cutting and pressing the remaining metals to desired sizes to sell as scrap metal (Knauf Shaw Bristol Myers Exhibit H, 15). Metalworking processes that involve cutting, pressing, and shearing metal pieces require the use of hydraulic and cutting oils (EPA 1995, 25, 35–36, 81; EPA 2004, 68). Hydraulic oils are cutting fluids and coolants used in presses, shears, and stamping equipment in metal fabrication (EPA 2004, 68). Prior to the 1980s, cutting and hydraulic oils commonly contained PCBs (EPA 1976, 43; Erickson and Kaley 2011, 7, 11). Hydraulic fluids are typically associated with Aroclors 1232–1260 (Aroclors 1232, 1242, 1248, 1254, 1260) and cutting oils with Aroclor 1254 (Erickson and Kaley 2011, 10–11). Hydraulic oils either drained from materials or used as a cutting fluid for hydraulic shears were documented on the Fulton Site (Knauf Shaw Bristol Myers Exhibit H, 15). Historically, shredded scrap materials (including metals and plastics) are known to contain PCBs, and the sources may be a combination of PCB containing products (Duranceau and Spangenberger 2011, 5). Recent studies characterizing shredder residue typically analyze waste originating from materials manufactured after the end of the PCB ban and therefore do not reflect PCB levels in older cars and appliances (Duranceau and Spangenberger 2011, 25). Auto shredder residue and electrical appliance shredder residue has been found to contain varying amounts of PCBs, typically in the ppm range, consisting mostly of tri-, tetra-, and pentachlorinated biphenyl homologs (Cheminfo 2014, 43). Scrap material from cars and appliances processed at the Fulton Site likely contained PCBs. Given that Fulton likely shredded

[14] The Voluntary Cleanup Agreement with NYSDEC listed the Fulton Site as New York State Superfund Site #734056 (NYSDEC 2019b).

materials manufactured prior to the PCB ban, the shredder residue on the Fulton Site may have contained higher PCB levels than the more recent materials reported above.

The 1997 Fulton Site closure report details investigations of groundwater, subsurface soil, and surficial soil samples for VOCs, semivolatile organic compounds (SVOCs), PCBs, and total metals (Knauf Shaw Bristol Myers Exhibit H, 16). Results of these investigations dictated remediation activities at the Site, including the removal of PCB and VOC contaminated soils and closure of the sanitary sewer (Knauf Shaw Bristol Myers Exhibit H, 17).

PCB remediation activities were conducted in 1996 in seven areas with soil PCB concentrations between 25 and 50 ppm and in five areas with soil PCB concentrations greater than 50 ppm (Knauf Shaw Bristol Myers Exhibit H, 17). PCBs detected in soils included Aroclors 1242, 1248, 1254, and 1260 (Knauf Shaw Bristol Myers Exhibit H, 71–300). All areas were excavated until discrete wall or floor samples measured <10 ppm PCBs, with the exception of area designated R2. Even with continued soil excavations, discrete sample concentrations of 33 ppm were still detected in the east wall of area R2 (Knauf Shaw Bristol Myers Exhibit H, 29). The excavation plan depicts area R2 immediately adjacent to South Branch Ley Creek, which serves as the western boundary of the Fulton Site (Knauf Shaw Bristol Myers Exhibit H, 55). Records from the NYSDEC Environmental Site Remediation Database indicate that, even with the residual PCB contamination, NYSDEC deemed it not an environmental threat as the contaminated groundwater was “confined to a low permeability clay overburden” (NYSDEC 2019b). No PCBs were detected in the groundwater for four years following the remediation and use of the Fulton Site is restricted to prevent future residential use (NYSDEC 2019b).

The 1996/1997 NYSDEC sediment sampling for PCBs discussed above in relation to the BMS Site included locations downstream, upstream, and at the upstream boundary of the Fulton Site (Figure 1). This sampling occurred after the final waste disposal dates from the Fulton Site remediation. Aroclors 1248, 1254, and 1260 were detected upstream, Aroclors 1254 and 1260 at the upstream boundary, and Aroclors 1242, 1248, 1254, and 1260 at downstream locations (Figure 1; Knauf Shaw Bristol Myers Site Dossier, 8). As discussed in the above paragraph, Aroclors 1242, 1248, 1254, and 1260 were detected in the Fulton Site soils.

In addition to the remediation activities described above, other surficial debris was removed from the property including rubber tires, large stones, scrap metal, railroad ties, and other equipment (Knauf Shaw Bristol Myers Exhibit H, 35). A transformer, labeled “non-PCB,” was removed by a third party and the stained soil beneath the transformer was removed and disposed of as a PCB contaminated material (Knauf Shaw Bristol Myers Exhibit H, 33).

2.2 Discharge Permits, Waste Handling, and/or Spills at the Site

For discharge of industrial wastewater to the sanitary sewer, BMS operated under Industrial Wastewater Discharge Permit #18 through the Onondaga County Department of Drainage and Sanitation (OCDDS) for several periods between 1977 and 1996 (Knauf Shaw Bristol Myers Exhibit J, 23–24). In discharges to the sanitary sewer system, BMS had multiple exceedances of the OCDDS permit limits for various chemicals (including VOCs, total nitrogen, and phosphorus) and pH levels in 1988 and 1989. Based on available documentation, BMS received eight Notices of Violation from OCDDS from 1990 to 1993 for pH violations,

improper notifications of spills, and for other chemical limit violations (Knauf Shaw Bristol Myers Exhibit J, 39–40).

BMS obtained its first State Pollutant Discharge Elimination System (SPDES) permit (NY-0233251) in 1992 (Knauf Shaw Bristol Myers Site Dossier, 6; Knauf Shaw Bristol Myers Exhibit F) after pleading guilty to negligent violations of the Clean Water Act for discharging solvent waste into the public stormwater sewer system (Knauf Shaw Bristol Myers Site Dossier, 6; Knauf Shaw Bristol Myers Exhibit E, 11–13). The SPDES permit identified 10 stormwater outfalls to South Branch Ley Creek and Headson's Brook (FOIL034697 at FOIL034729) and covered dry weather flow discharges and monitoring of four of the outfalls (#2, #3, #7, and #9) (Knauf Shaw Bristol Myers Site Dossier, 6). The SPDES permit was modified in 2004 to reduce the stormwater and dry-weather flow monitoring requirements (FOIL195717; Knauf Shaw Bristol Myers Site Dossier, 7). PCBs were not listed as a monitoring requirement in the SPDES permit.

2.2.1 Waste Handling Related to PCBs

Waste records for BMS under generator number NYD002230902 and NYD980592984[15] (Knauf Shaw Bristol Myers Exhibit B, 1–3; FOIL247206 at FOIL247206) indicate disposals between 1987 and 2018 with PCB hazardous waste codes B002 (petroleum oil or other liquids containing PCBs), B004/B005 (other PCB-containing equipment[16]), B006 (PCB transformers), and B007 (other PCB containing waste such as contaminated site media or cloth), as classified by the state of New York (6 CRR-NY 371.4 [e]). In addition to the transformer related PCB wastes discussed in Section 2.1.1, BMS waste records (Knauf Shaw Bristol Myers Exhibit B, 1–3) indicate that PCB-containing materials were removed from 1992 to 2009 (1,253 kg of B005 and 70 kg of B004), more PCB oil was disposed of in 2013 (719 kg of B002), and large amounts of other PCB wastes—which could include contaminated soil, solids, sludges, clothing, rags and dredge material—were disposed of from 1987 to 2018 (418,032 kg of B007). All PCB-related waste disposals are summarized in Table 1. The large amount of contaminated waste in 1996 can be attributed to the excavation of PCB-containing soils from the Fulton Site remediation, although not all of the records match with the hazardous soil disposal manifests from the Fulton Site closure report (Knauf Shaw Bristol Myers Exhibit H, 380–473). Out of the twenty records for BMS B007 waste in 1996, fourteen of them match the New York state manifest numbers in the closure report, accounting for 288,813 kg, or 69.5% of the total. While the remaining six records do not match with the closure report manifests, they do fall within the same time frame, are similar weights (about 20,000 kg), and were sent to the same waste facility as the matching records. These similarities suggest that these records could have been part of the Fulton Site excavations, but without matching records, the nature of the remaining 127,015 kg of B007 waste (representing 30.5% of the 1996 total) is unconfirmed.

[15] Hazardous waste generator number NYD002230902 is listed for BMS at 3551 Burnet Ave in Syracuse (at the BMS Site) (Knauf Shaw Bristol Myers Exhibit B, 1). Hazardous waste generator number NYD980592984 is listed for BMS at an address of Burnet and Clark in Syracuse (FOIL247206 at FOIL247206). The location of the Clark cross street is unspecified and could not be located by TIG, however no other BMS facility is known to exist at a separate location on Burnet Ave and therefore the associated waste records are assumed to be part of the BMS Site.

[16] B004 and B005 waste is defined as PCB articles or equipment, excluding transformers and small capacitors, with 50–500 ppm PCBs and greater than 500 ppm PCBs, respectively (6 CRR-NY 371.4 [e]).

The waste records for 2013 match the waste list for the Transformation Project, which described the removal of four drums of “PCB liquid” (B002), four boxes and four drums of “PCB caulk” (B007), and one drum of “PCBs” () (Table 1; FOIL007505 at FOIL007535).

2.2.2 Spills Related to PCBs

There is a long history of spills at the BMS Site, although most are related to solvents or oils (Knauf Shaw Bristol Myers Exhibit D). Spills and/or contamination have been documented as early as 1967 to Headson’s Brook through stormwater outfalls that discharge directly to the storm sewer system instead of the sanitary sewer system (Knauf Shaw Bristol Myers Exhibit J, 35). Historical lists of spills at the BMS Site have been compiled and described in multiple site reports (Knauf Shaw Bristol Myers Exhibit J, 35–39; Knauf Shaw Bristol Myers Exhibit K, 39–41, 67; FOIL034697 at FOIL034716) and summarized in the Site dossier prepared by Knauf Shaw (Knauf Shaw Bristol Myers Site Dossier, 2). These include at least 33 instances of small- and large-volume spills (up to 5,000 gallons) discharged directly into waterways, drained into the sanitary sewer system, into soils, into the storm sewer, on the roadways, or released into the air between 1976 and 2007. Of the documented spills, the largest were of fuel oil and solvents that are not likely to be related to PCBs.

Various remediation activities were performed in response to the spills as deemed necessary (soil removal, installation of solvent recovery systems, storm sewer rehabilitation). None of the earlier documented spills refer to PCBs, however it is possible that undocumented spills involving PCBs occurred, given waste records include large amounts of PCB-contaminated waste unrelated to the Fulton Site remediation (discussed in Section 2.1.2) and the fact that BMS has a history of permit violations for improperly reporting spills to Onondaga County personnel (Knauf Shaw Bristol Myers Exhibit J, 40). In 2018, spilled non-PCB heat exchange fluid from building 25N demolition activities discharged into South Branch Ley Creek via outfall #7 after passing through the stormwater pollution prevention controls (FOIL033818 at FOIL033818). No earlier records of the heat exchange system are available in the reviewed documents; however, it is possible that in the past it contained Therminol FR-1, which BMS purchased in the early 1970s (Knauf Shaw Bristol Myers Site Dossier, 2).

The Fulton Site does not have any spill records, however the evidence of PCB contamination and subsequent remediation discussed in Section 2.1.2 and documented in the 1997 Closure Report (Knauf Shaw Bristol Myers Exhibit H) indicates that spills involving PCBs (likely from hydraulic oils) must have occurred.

2.3 PCB Discharges to Ley Creek or Tributaries

This section discusses the documented or potential discharge pathways of PCBs from the Site, with emphasis on discharges to Ley Creek or its tributaries.

2.3.1 Direct Discharge

This section discusses the documented or potential PCB-containing direct discharges from the Site to Ley Creek or its tributaries.

- PCBs have been detected in sediments in South Branch Ley Creek and Headson's Brook near the Site (Knauf Shaw Bristol Myers Site Dossier, 3). PCBs are known and suspected to have been used at the Site in several operations. Dozens of releases of other chemicals are documented onsite, including directly into waterways (see Section 2.2.2). While there are no confirmed releases of PCB-containing materials to South Branch Ley Creek or Headson's Brook, an understanding of sampling data, site history, and housekeeping conditions suggests that this is a potential pathway.

2.3.2 Sanitary Sewer

This section discusses the documented or potential PCB-containing discharges from the Site via sanitary sewers.

- No PCB-containing discharges are documented from the Site to South Branch Ley Creek or Headson's Brook via sanitary sewers, however sanitary sewer discharges of other chemicals have been recorded (see Sections 2.2 and 2.2.2).

2.3.3 Storm Sewer

This section discusses the documented or potential PCB-containing discharges from the Site via storm sewers.

- PCBs have been detected in surface soils on the BMS and Fulton Sites and in the sediments in South Branch Ley Creek and Headson's Brook near storm sewer outfalls (Knauf Shaw Bristol Myers Exhibit J, 67; FOIL096401 at FOIL096465, FOIL096467; Knauf Shaw Bristol Myers Exhibit H, 31–32). While there are no documented releases of PCB-containing material into the storm sewer, other chemicals onsite have been discharged to the storm sewer (see Sections 2.2 and 2.2.2), indicating a potential storm sewer discharge pathway for PCBs.
- Based on the fact that BMS used a heat transfer system as of 2018 with documented spills to the storm sewer, and the fact that BMS apparently purchased Therminol FR-1 (a PCB-containing fluid used in heat transfer systems) for use at the site, it is possible that discharges or spills occurred from the prior, PCB-containing heat transfer system to South Branch Ley Creek. Therefore, a potential PCB discharge pathway to South Branch Ley Creek exists, more specifically via outfall #7 as that was the discharge point from the 2018 heat exchange fluid spill.

2.3.4 Runoff

This section discusses the documented or potential PCB-containing discharges from the Site to Ley Creek or its tributaries via stormwater runoff.

- PCBs detected in surface soil on the BMS and Fulton Sites and in sediments in South Branch Ley Creek and Headson's Brook indicate a potential stormwater runoff discharge pathway. Rail spurs on the Site could have potentially functioned as preferential pathways for surface runoff onsite.

2.3.5 Groundwater

This section discusses the documented or potential PCB-containing discharges from the Site to Ley Creek or its tributaries via groundwater.

- Although PCBs have not been detected in groundwater, the groundwater on the Site flows toward South Branch Ley Creek and Headson's Brook, and therefore a high potential exists for migration of other contaminants (primarily VOCs) to this tributary of Ley Creek and therefore Ley Creek via groundwater (Knauf Shaw Bristol Myers Site Dossier, 5).

3. Data Gaps

TIG Environmental has identified the following data gaps that would increase the understanding of how PCBs were used onsite and/or released from the BMS and Fulton Sites.

- A 2018 email correspondence between the BMS site managers and NYSDEC indicates analytical results of liquid found in building 25/25N tank vault (where a heat exchange system was removed and where heat exchange fluids are stored) were listed as email attachments in the reviewed documentation, but not provided (FOIL009128 at FOIL009207).
    - Recommendation: Request described attachments named BMS60-1992835-Bristol-Myers Squibb 09-29-2018.pdf and C734138 Bldg 25 Demo Brine Tanks Vault Plan Addendum.pdf from NYSDEC.
- A 2018 email correspondence between the site managers and the NYSDEC indicates analytical results of discolored soil found underneath building 25/25N basement (where a heat exchange system was removed and where heat exchange fluids are stored) were listed as email attachments in the reviewed documentation but not provided (FOIL009128 at FOIL009299).
    - Recommendation: Request described attachments named J141320-1 UDS Level 2 Report Final Report.pdf and C734138 Bldg 25 Demo Brine Tanks Vault and Drain Sumps Plan.pdf from NYSDEC.
- Documents refer to the presence of a heat exchanger and heat exchange fluid in 2018, and BMS had purchased Therminol FR-1 which was used in heat transfer systems. The following information was not available in the documents reviewed: the capacity of the system relative to the volume of Therminol FR-1 that was purchased, how often the system was cleaned or refilled, how the heat transfer system was cooled, and where cooling water was discharged. While the existence of a heat exchange system on the Site during the time when PCBs were in use in such systems is likely, further information is needed to confirm and fully characterize its link to PCB use.
- Analyses from two different studies on sediments in South Branch Ley Creek – one conducted by NYSDEC in 1996/1997 and the second conducted by Arcadis in 2015 – indicate that PCB concentrations are higher upstream of the BMS Site boundary, suggesting an upstream PCB source is likely responsible for the contamination found in South Branch Ley Creek. However, this interpretation is questionable as the data reported shows concentrations in samples collected by NYSDEC upstream of the Site were only slightly higher, and within the same order of magnitude as concentrations from within

the Site. Additionally, only one sample collected upstream of the Site by Arcadis in 2015 contained PCBs. The PCB concentration in this sample was equal to or smaller than several of the samples in South Branch Ley Creek and Headson's Brook. Further information on possible upstream sources is necessary to fully understand if another PCB source is contributing to the contamination in the South Branch Ley Creek sediments within the BMS and Fulton Sites. TIG Environmental has not performed an investigation of potential upstream sources.

4. Proposed Sampling to Assess Contributions to the Study Area

Because of the data gaps identified in Section 3, TIG Environmental proposes additional sampling at the Site and the adjacent Fulton Site, as described below. The sampling locations should be analyzed for PCB Aroclors (EPA Method 8082A), PCB congeners (EPA Method 1668C), total organic carbon (Lloyd Kahn method), grain size (ASTM D422), and total solids (ASTM D2216-98). In addition to those parameters, TIG Environmental may also propose sampling for particular contaminant classes (that is, metals, PAHs, VOCs, or SVOCs) depending on the nature of operations around a particular sampling location.

4.1 Soil

TIG Environmental proposes further soil sampling for PCB congener analysis on the Fulton Site near area R2, where residual PCB concentrations were highest post-remediation, and on the BMS Site near the former building 25/25N (where a heat transfer system was used), and between building 22 and Thompson Road (where elevated total PCBs were detected in soils).

4.2 Sediment

Further sediment sampling is proposed for PCB congener analysis in Headson's Brook between outfalls #2 and #3, and in South Branch Ley Creek between outfalls #7 and #8, in South Branch Ley Creek downstream of outfall #4, and at one location in South Branch Ley Creek upstream of the Site.

5. References

This ESM was prepared using the evidentiary materials listed below and provided with this document.

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